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Indian Standard

RECOMMENDED PRACTICE FOR PREPARATION OF IRON AND STEEL FOR ELECTROPLATING

PART II LOW CARBON STEEL

(First Revision)

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RECOMMENDED PRACTICE FOR PREPARATION OF IRON AND STEEL FOR ELECTROPLATING

PART II LOW CARBON STEEL

(First Revision)

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Indian Standard

RECOMMENDED PRACTICE FOR PREPARATION OF IRON AND STEEL FOR ELECTROPLATING

PART II LOW CARBON STEEL

(*First Revision*)

0. FOREWORD

0.1 This Indian Standard (Part II) (First Revision) was adopted by the Indian Standards Institution on 10 June 1980, after the draft finalized by the Metallic Finishes Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 Preparation of low carbon steel was earlier covered in IS : 1985-1962*. While reviewing this standard, it was decided to cover the preparation of iron and steel for electroplating in three parts. Preparation of high carbon steel is covered in Part I; while preparation of iron casting is covered in Part III. Preparation of non-ferrous metals for electroplating will be covered in separate standard.

1. SCOPE

1.1 This standard (Part II) is intended as an aid to platers in setting up a suitable cleaning cycle preparatory to electroplating of low carbon steels, containing less than 0·3 percent carbon. It also includes precautions that should be taken to maintain the cycle in good operating conditions.

2. CLEANING

2.1 Oil, grease, scale and smut should be removed by usual cleaning processes. For details refer to IS : 3194-1980†. Oxide film, if any, should be removed by pickling.

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*Code of practice for pretreatment of steel, copper and copper base alloys, zinc and zinc base alloys for electroplating.

†Recommended practice for cleaning metals prior to electroplating (*first revision*).

2.1.1 Lubricants and finishing compounds may have to be removed by precleaning before the article reaches the plating room. It may be accomplished with alkaline soak cleaners, emulsion cleaners, cleaners designed to remove buffing compounds, alkaline spray cleaners and the use of chlorinated solvents, such as trichloroethylene and perchloroethylene in vapour type degreasing equipment, or by use of cold chlorinated solvents, if vapour equipment is not available. The lubricants should be cleaned as early as possible and should not be allowed to remain on surface for long, as otherwise it becomes difficult to remove them.

2.1.2 *Anodic Cleaning* — The part to be cleaned should be anodically cleaned in a hot solution (up to 90°C) of a suitable compounded free-rinsing high conductivity steel alkaline cleaner about 60 to 120 g/l. The current density should preferably be between 500 A/m^2 and 1 600 A/m^2 and the tank voltage about 6 V.

Time of cleaning may vary from 1 to 4 minutes depending upon the size and shape of the part. If proprietary cleaners are used, the recommendations of the manufacturer should be followed.

2.1.3 *Cold Water Rinse* — Immerse the parts to be cleaned in clean overflowing water for a minimum of 15 seconds. If possible, air agitation of the water rinse should be provided. A fresh water spray on the part, as it enters and leaves, helps to ensure complete rinsing.

2.1.4 *Acid Pickling Dip* — Dip the part in a solution of 15 to 50 volume percent hydrochloric acid or 10 volume percent sulphuric acid for a sufficient length of time to remove all oxides, rust or scale.

NOTE 1 — In place of acid dip, alkaline descaling is sometimes found to be more practical. Such solutions are operated at about 40°C and at an average current density of 200-500 A/m^2. When using this method, it shall be followed by water rinse (*see* **2.1.3**) and acid dip (*see* **2.1.4**) followed by another water rinse (*see* **2.1.5**).

NOTE 2 — While pickling in strong hydrochloric acid is suitable for most oxide conditions, including heavy annealing scale welding marks, or wheel burns, it may sometimes be preferable to use hot sulphuric acid (about 10 volume percent) containing a suitable inhibitor to protect the steel from over-pickling. The acid temperature may vary between 50°C and 70°C. When inhibitors are used, a second alkaline cleaning operation, preferably electrocleaning, should follow pickling to remove any adsorbed inhibitor.

NOTE 3 — Heavy scale may be removed more rapidly by making the part to be pickled either anodic or cathodic in a 5 to 10 volume percent sulphuric acid or proprietary acid salt solution at a temperature of 50 to 65°C and at an average current density of about 400A/m^2. Anodic pickling avoids hydrogen embrittlement. Cathodic pickling provides a brighter surface provided the pickling solution is not contaminated with heavy metals such as copper, tin or lead.

NOTE 4 — In addition to acid pickling, scale may be removed by shot-blasting, tumbling, or sand-blasting. These methods avoid hydrogen embrittlement but may work-harden the surface.

2.1.5 *Water Rinse* — Rinse the part in freely flowing cold water as described in **2.1.3**.

NOTE 1 — Plants with limited facilities sometimes omit precleaning especially with work that is not too heavily soiled. This is permissible; however, electrocleaning time may have to be increased and it is almost always necessary to change electrocleaners more frequently. Likewise, close control is necessary to ensure proper electrocleaner concentration at all times.

NOTE 2 — When there is a lapse of time between the final rinsing operation of the preparatory cleaning process and plating, arrangements should be made for temporary storage of parts. Those which are to be plated in a cyanide solution may be stored in a solution of 15 to 30 g/l of sodium cyanide and an equal amount of sodium hydroxide at room temperature. Those which are to be plated in an alkaline solution, such as alkaline tin, should be stored in a solution containing 8 g/l of sodium hydroxide at room temperature. Storage time for parts to be nickel plated should be minimized but, if necessary, they may be held in clean cold water for a very short time.

3. PROCEDURE FOR PARTS IN BULK

3.1 Alkaline Cleaning — Clean the parts by tumbling with or without current, in a solution of 30 to 60 g/l of a suitable alkaline cleaner at 80 to 90°C. Anodic electrocleaning at about 200-400 A/m^2 may supplement tumbling for more effective cleaning.

3.2 Water Rinse — Rinse the parts in clean, overflowing water. Air-agitation of the rinse water is beneficial.

NOTE — Two water rinses after both cleaning and acid pickling are beneficial in many barrel plating operations. This serves to ensure more complete rinsing and thus prevent carry-over of cleaners of acids into subsequent tanks.

3.3 Acid Pickling — Pickle in a solution of 15 to 50 volume percent hydrochloric acid at room temperature. Other suitable pickling solutions are proprietary acid salts and 5 to 15 volume percent sulphuric acid.

NOTE — Heavily scaled parts, such as heat-treated nuts and bolts may require pickling in strong inhibited sulphuric acid. Tumble-pickling is preferred to immersion-pickling in bulk because the tumbling action increases the rate of scale and oxide removal.

3.4 Water Rinse — Rinse the parts again as described in **3.2** using a separate tank.

INDIAN STANDARDS ON CODES OF PRACTICE FOR METALLIC FINISHES

IS :

1340-1977	Code of practice for chromate conversion coating on zinc and cadmium coated articles and zinc base alloys (*first revision*)
1985-1962	Code of practice for pretreatment of steel, copper base alloys, zinc and zinc base alloys for electroplating
1985	Recommended practice for preparation of iron and steel for electroplating:
(Part I)-1980	High carbon steel (*first revision*)
(Part II)-1980	Low carbon steel (*first revision*)
(Part III)-1980	Iron castings (*first revision*)
1986-1962	Code of practice for hard chromium plating on steel
2450-1963	Recommended practice for plating on aluminium and its alloys
3194-1980	Recommended practice for cleaning metals prior to electroplating (*first revision*)
3655-1966	Recommended practice for electroplating
3656-1968	Code of recommended practice for mechanical polishing of metals for electroplating
5925-1970	Recommended practice for silver plating for general engineering purposes
6586-1972	Recommended practice for metal spraying for protection of iron and steel
7088-1973	Recommended practice for anodizing aluminium and its alloys
9531-1980	Recommended practice for preparation of copper and copper-base alloys for electroplating